U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: Pseudanophthalmus inexpectatus Barr

COMMON NAME: Surprising cave beetle

LEAD REGION: 4

INFORMATION CURRENT AS OF: October 2005

STATUS/ACTION:

___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

___ New candidate

_x_ Continuing candidate

___ Non-petitioned

_x_ Petitioned - Date petition received: May 11, 2004

_ 90-day positive - FR date:

_ 12-month warranted but precluded - FR date:

_ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? _yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? _yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).

___ Listing priority change

Former LP: ___

New LP: ___

Date the species first became a Candidate (as currently defined): October 30, 2001

___ Candidate removal: Former LP: ___

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F – Range is no longer a U.S. territory.
___ I – Insufficient information exists on biological vulnerability and threats to support listing.
___ M – Taxon mistakenly included in past notice of review.
___ N – Taxon does not meet the Act's definition of "species."
___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Insects, Family Carabidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Kentucky

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Kentucky

LAND OWNERSHIP
The caves supporting the surprising cave beetles are located on federally owned lands managed by the National Park Service (NPS) in Mammoth Cave National Park (MCNP).

LEAD REGION CONTACT: Richard Gooch, (404) 679-7124, Richard_Gooch@fws.gov

LEAD FIELD OFFICE CONTACT: Kentucky Field Office, KY – Dr. Michael A. Floyd, (502) 695-0468, Mike_Floyd@fws.gov

BIOLOGICAL INFORMATION

Species Description/Taxonomy
Cave beetles in the genus Pseudanophthalmus are fairly small, eyeless, reddish-brown insects that belong to the predatory ground beetle family Carabidae and subfamily Trechinae. Like most other insects, they have six legs and a body that consists of a head, thorax, and abdomen. Depending on the species, body length is generally from 3.0 to 6.0 millimeters (mm) (0.12 to 0.24 inches); total body length for the surprising cave beetle is 4 mm. The different species within the genus are differentiated by differences in the shape and size of the various body parts, especially the shape of the male appendages (genitalia) used during reproduction (Barr 1996).

The genus Pseudanophthalmus contains an estimated 225 species within eastern North America (Barr 1996, 2004); more than 75 percent of Kentucky's approximate 95 cave beetle species belong to this genus (Barr 1996). The surprising cave beetle was described by Barr (1959) from specimens collected in the historic section of Mammoth Cave and White Cave, MCNP, Edmonson County, Kentucky. Barr (1996) initially recognized the surprising cave beetle as one

of six eastern species in the gracilis species group; Barr (2004) has now placed the species in the inexpectatus group. The inexpectatus group is characterized by the males having a median indentation in the posterior margin of the last abdominal sternite (ventral surface of abdomen); the male aedeagus (phallus) and copulatory sclerites are similar to the gracilis group but are much longer and more slender. I have carefully reviewed the available taxonomic information on this species to reach the conclusion that the species is a valid taxon.

Habitat/Life History

Most members of this genus are cave dependent (troglobites) and are not found outside the cave environment. All are predatory and feed upon small cave invertebrates such as spiders, mites, millipedes, and diplurans (Barr 1996). Members of this genus can be common and widespread to extremely rare and likely endemic.

Little detailed life history information is available for the rarest of the cave beetles, but the generalized summary that follows is accurate for the more common and more easily studied species and is believed to also apply to the rarer species (Barr 1998). Cave beetles copulate in the fall, and the eggs are deposited in the cave soil during late fall. The eggs hatch and larvae appear in late fall through early winter. Pupation occurs in late winter to early summer with the adult beetles emerging in early summer (Barr 1996).

The limestone caves supporting these beetles provide a unique and fragile environment that supports a variety of species that have evolved to survive and reproduce under the demanding conditions found in cave ecosystems. No photosynthesis takes place within the dark zone of a cave. Therefore, all organisms that are adapted to life within a cave are dependent upon energy from the surface. This energy can be in the form of cave cricket guano, bat guano, wood rat latrines, leaf litter, woody debris, and small bits of organic matter that falls or is washed into the cave (Barr 1996). Based on the physical characteristics of known collection sites, the habitat requirements for the P. inexpectatus appear to be wet, rotting wood in humid, protected microhabitats with slow air flow. Woody material in these areas was imported by man, so the natural habitat for this species is unknown (Barr 1996).

Historic and Current Range/Distribution

The surprising cave beetle is endemic to portions of the Mammoth Cave system; it has been observed in the historic section of Mammoth Cave, White Cave, Great Onyx Cave, and a fourth unidentified cave in MCNP (located on the north side of the Green River), Edmonson County, Kentucky (Barr 1996; Dr. Kurt Helf, personal communication, invertebrate ecologist, Mammoth Cave National Park, October 2005). Its current distribution is limited to the aforementioned caves in MCNP.

Population Estimates/Status

All known occurrences of the surprising cave beetle are restricted to four caves within MCNP. Actual population numbers are unknown (Dr. Kurt Helf, personal communication, invertebrate ecologist, Mammoth Cave National Park, October 2005).

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range. The limited distribution of this species makes it vulnerable to isolated events that would only have a minimal effect on the more wide-ranging members of the genus. Events such as toxic chemical spills, discharges of large amounts of polluted water, closure of entrances, alteration of entrances, or the creation of new entrances can have serious adverse impacts on these cave beetles and could result in their extinction (Barr 1996). Caves and the species that are completely dependent upon them (troglobites) receive the energy that forms the basis of the cave food chain from outside the cave. This energy can be in the form of guano deposited by cave-dependent species (cave crickets, bats, wood rats), large or small woody debris washed or blown into the cave, or tiny bits of organic matter that is carried into the cave by water through small cracks in the rocks overlaying the cave (Barr 1996). Activities such as industrial, residential, commercial, or highway construction can, if not planned in a manner to protect caves, directly destroy caves or result in severe modification of the natural processes that maintain the sensitive biological systems they support. Pollution and chemical contamination can, under certain circumstances, result in the complete destruction of the unique life found within a cave impacted by these factors. There have been incidents that resulted in pollution entering MCNP's caves, primarily the result of contaminated water entering the recharge area for the MCNP's caves (the watersheds for some of the caves extend beyond the MCNP boundary). Loss or reduction of the supply of energy can result in the loss or severe reduction of cave beetle populations (Barr 1996).

Many of these fragile caves have been adversely impacted. About 40 years ago, the wooden debris within the historic section of Mammoth Cave was removed, and the surprising cave beetle has not been observed there since that time. Wood is also the basis of the food chain in White Cave, and the wood at this site is slowly decaying. White Cave is gated, so this gate may be restricting, to some extent, the quantity of woody debris that enters the cave. Barr (1996) has observed a gradual decrease in the number of surprising cave beetles in White Cave as the quantity of available wood has decreased. Protection of caves and cave dependent species must include both the physical environment in which the species are found and the surface components that provide the energy and clean water needed for survival. The magnitude of the threat to the surprising cave beetle has been reduced because all of the known populations are located on Federal lands, and the formal commitment through the CCA between MCNP and the Service serves to protect the species.

B. Overutilization for commercial, recreational, scientific, or educational purposes. Most populations are extremely small and careless collecting, whether for scientific or other purposes, could adversely affect them. These species have no known commercial value, but the caves in which these species occur may be used for recreational purposes by spelunkers and by passive recreationists.

C. Disease or predation.

Disease or predation is not known to be a significant problem for this species. However, since the species appears to exist with low numbers of individuals, mortality via either of these two factors may have a significant, negative impact on recruitment and long-term survival.

D. The inadequacy of existing regulatory mechanisms.
MCNP requires a park scientific collecting permit before any collecting or scientific study is initiated. Otherwise, this species is not protected under Kentucky state law. Unauthorized human entry into these caves is limited by their location within Mammoth Cave National Park.
E. Other natural or manmade factors affecting its continued existence.
None are known at this time.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED
The Kentucky Department of Fish and Wildlife Resources (KDFWR) in cooperation with the Service funded a status survey for the rarer cave beetles that occur in Kentucky (Barr 1996). In September 2001, MCNP and the Service entered into a Candidate Conservation Agreement (CCA) for the surprising cave beetle. The purpose of this CCA is for the Service and NPS to jointly implement conservation measures for the surprising cave beetle in MCNP. The CCA will ensure that all habitat components required to protect and improve the conservation status of this species, especially an adequate food source, are provided through the NPS's management of the caves that support the species. Under this CCA, MCNP has developed and implemented a monitoring program for the species and its habitat. In 2002, MCNP discovered a previously unknown population of this species in a fourth MCNP cave. Activities undertaken by MCNP under the CCA will increase protection and enhance the status of this species. The CCA was renewed in 2004, and the NPS will continue their CCA commitments.

SUMMARY OF THREATS (including reasons for addition or removal from candidacy, if appropriate)
Threats to the surprising cave beetle include isolated toxic chemical spills (primarily outside of the MCNP boundary); polluted stormwater runoff originating from agricultural or urban areas; manipulation of cave entrances (closure, alteration/blockage, and creation of entrances); trampling by humans; and excessive scientific collecting. The greatest threats to the species are (1) the depletion of suitable microhabitats (loss of woody debris) in the historic section of Mammoth Cave (Crevice Pit) and at the back of White Cave and (2) the disruption of energy inputs from the surface.

For species that are being removed from candidate status:
___Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES
The CCA between the NPS and the Service should be continued for the foreseeable future. Conservation recommendations included in the CCA should be implemented; monitoring should be conducted by NPS staff to document the species' continued presence and determine effectiveness of conservation measures included in the CCA.

In addition to those recommendations listed in the CCA, Barr (1996) recommended three conservation efforts that would provide protection and conservation for the surprising cave beetle: (a) suspend tours in White Cave (use Dixon Cave or Great Onyx Cave instead) or modify the tours so that persons do not approach the pit where beetles have been observed; (b) prohibit entry into the crawlway in Great Onyx Cave where surprising cave beetles have been located; and (c) attempt to restore a suitable habitat at "Crevice Pit", the original site in the historic section of Mammoth Cave where beetles were first observed.

LISTING PRIORITY:

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	**11***
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: The species' limited distribution makes it vulnerable to isolated toxic chemical spills, discharges of large amounts of polluted water, closure of entrances, alteration of entrances, or the creation of new entrances. However, the magnitude of the threat to the surprising cave beetle is reduced because all of the known populations are located on Federal lands, and the formal commitment through the CCA between MCNP and the Service serves to protect the species. Also, there is a generally low probability that spills, entrance closures, or other significant perturbations to the species' habitat could occur due to the large federal ownership that comprises the species' range.

Imminence: The threats faced by this species are serious but not likely to be immediate. We do not anticipate that this species will be subjected to these threats in the immediate future (next 1 to 2 years). The CCA between the NPS and the Service decreases the likelihood that these threats will be realized.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No

DESCRIPTION OF MONITORING

Monitoring of this species is primarily conducted by a NPS entomologist. Additionally, a fiscal year 2004 cooperative agreement between the Kentucky State Nature Preserves Commission and the Service will fund status surveys for this species in late summer or early fall of 2005. Surveys within Mammoth Cave National Park (MCNP) (historic section of Mammoth Cave, White Cave, and Great Onyx Cave) for *P. inexpectatus* will be conducted in late summer or early fall of 2005. The recent discovery of *P. inexpectatus* in a cave located on MCNP but from the north side of Green River suggests that this species may have a wider distribution than first thought. Searches will be conducted at additional caves in MCNP to determine if the species is more widely distributed (Dr. Kurt Helf, personal communication, invertebrate ecologist, Mammoth Cave National Park, October 2005).

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: Kentucky – Mammoth Cave National Park (Dr. Kurt Helf) and Kentucky State Nature Preserves Commission (Mr. Ellis Laudermilk).

Indicate which State(s) did not provide any information or comments: N/A

LITERATURE CITED

Barr, Thomas C. 1959. New cave beetles (Carabidae, Trechini) from Tennessee and Kentucky. Journal Tennessee Academy of Science 34:5-30.

Barr, Thomas C. 1995. Kentucky Cave Beetles: Progress Report II. Unpublished Report to Kentucky Department of Fish and Wildlife Resources. Frankfort, Kentucky. 20 pp.

Barr, Thomas C., 1996. Cave Beetle Status Survey and Prelisting Recovery Project. Unpublished Report to Kentucky Department of Fish and Wildlife Resources, Frankfort, Kentucky, and the U.S. Fish and Wildlife Service, Asheville, North Carolina. 63 pp.

Barr, Thomas C. 1998. Study of Potentially Threatened or Endangered Species of Cave Beetles in Tennessee, Alabama and Georgia. Interim Progress Report to the Tennessee Wildlife Resources Commission. 11 pp.

Barr, T. C. 2004. A classification and checklist of the genus *Pseudanophthalmus* Jeannel (Coleoptera: Carabidae: Trechinae). Special Publication 11, Virginia Museum of Natural History, Martinsville, Virginia.

Krekeler, C. H. 1973. Cave Beetles of the Genus Pseudanophthalmus (Coleoptera, Carabidae)

from the Kentucky Bluegrass and Vicinity. Feildiana 62(4):35-83.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Jeffrey M. Fleming 11/16/2005
Acting Regional Director, Fish and Wildlife Service Date

Concur: _____ August 23, 2006
Acting Director, Fish and Wildlife Service Date

Do Not Concur: _____ _____
Director, Fish and Wildlife Service Date

Date of annual review: October 2005

Conducted by: Frankfurt, Kentucky Field Office